CHAPTER ONE

Introduction

1.1Introduction:

In 1980's, healthcare services faced serious financial challenges from federal and local reforms (Solomon and Martino) in US since then, medical institutions have paid considerable attention on improving the efficiency of care services in healthcare sector (Loeb). Financial and non – financial factors act as key performance indicators in the health sector. As the economic environment is becoming more challenging and competitive, it is necessary to observe the performance indicator in order to ensure high-quality services with improved efficiency within the operational boundaries. As there is a growing consensus of become cost efficient and more productive in delivering services in the health care sector, it is important to look into the effectiveness of key performance indicators (Forman). These indicators act as a base for quality improvement and clearness in the health care sector. Nevertheless, very few people in the sector are comfortable in measuring these performance indicators. (Solomon and Martino; 1980)

Given the remarkable advancements in the field of radiology, the critical part of images in present day clinical practice on top of the expense increment of indicative imaging administrations, radiology ought to fundamentally concentrate on enhancing procedure and asset administration, as far as operations effectiveness is concerned. Magnetic Resonance Imaging (MRI) and Automated Axial Tomography (CAT) describe key resources in radiological departments: reimbursement rates are high while administration handling times are for the most part long (Abujudeh et al., 575). Hence, the objective of enhancing these regions ought to be considered as a priority. In this case, Operations Management systems may help to accomplish this objective through

the examination of procedures, administration levels, and quality principles. (Solomon and Martino; 1980)

In most cases, experts in radiological sciences are inexperienced in the process of optimization and re-engineering; they may be convinced that several critical issues in their various departments can be handled through the adoption of rough-cut strategies. On the contrary, these strategies tend to cause negative implication in regards to the side effects. It is not advisable to cut costs without a sufficient comprehension of the issues that causes the inefficiency (Abujudeh et al., 579). The implementation of newer information system on top of the already existing enhances management complexity. A simple top-down duty is not enough because the goal is only attained through staff encouragement and coordination.

The purpose of this study is to explore potentialities of radiology operations management techniques in the context of providing health services. In particular, the research focuses on the implementation strategies with reference to the diagnostic and radiological imaging field. The review of literature outlines the current growing attention in healthcare, particularly regarding the business focused management of public health facilities.

1.2 Problem statement

As performance indicators measurement have become critical for quality, transparency and prioritization in the health care sector, the assessment can aid in the development of best practices that in turn will help in giving positive outcomes in patient care. Nevertheless, limited research has been done on the incorporation and effectiveness of performance indicators in radiology department. Hence, the main focus of this research is to access the effectiveness of key variable of performance indicators and their impact on radiology department.

1-3 Objectives

1.3.1 General objective

The main focus of this research is to describe and assess the impact of key performance indicators in Radiology department.

1-3-2 Specific objectives

- To evaluate the key performance indicators consisting of non-financial (quality) indicators used by radiology departments.
- To determine the frequency of evaluation done of key indicators
- To determine the importance of the key indicators in decreasing order.
- To conclude an interconnection between various performance indicators.

1-4 Significant of the study

As healthcare demand continues to climb and imaging utilization escalates more than ever, Technologists and Radiology department administrators have to control their imaging performance. In fact that is impossible without the use of quality and operational indicators. Indicators create the basis for accountability, quality improvement, prioritization, and transparency in the healthcare.

CHAPTER TWO

LITERATURE REVIEW

2-1 Imaging and Its Implications for the Healthcare Sector

The practical of medicine is undergoing continuous change, and one of the key facilitators of these changes is medical imaging.

Medical Imaging or Imaging can be defined as an ensemble of diagnostic tests displaying the human body, performed and interpreted by physicians regardless of their specialty (radiology, cardiology, ob-gyn, etc.)- Radiology is the portion of medical imaging performed by radiologists. Imaging, one of the fastest growing fields in medicine due in part to its unavoidable link to technology, is facing tremendous challenges. As new technologies are developed and more applications for existing technologies are proposed, there is a sharp increase in the use of imaging by clinical specialties, so that imaging has become an essential component in the practice of clinical medicine (Chan, S. et al 2002).The increase of imaging demand led by advanced procedures (especially in Magnetic Resonance Imaging -MRI-, and Computed Tomography -CT-) For example. Basically doubling of studies performed early in this decade[4]. This trend represents an enormous workload increment for radiologists, who already face the challenge of a reduced workforce. (Chan, S. et al 2002).

As healthcare demand continues to climb and imaging utilization escalates more than ever, external pressure from the governments and private parties financing the healthcare sector has been put on hospitals and physicians to control their imaging performance. Imaging has become fundamental to the practice of medicine, as it is an essential extension of the physical examination and can empower physicians to provide the most effective and efficient patient care (Silver M, Yi C, et al 2003). From a managerial point of view, radiology departments are among the most expensive department in hospitals, and they

attract patients to the hospitals from physicians' offices and small private radiology facilities without advanced imaging services (Silver M, Yi C, et al 2003).. Thus, hospitals and practice administrators need to pay closer attention to their organization and process and try to optimize their efficiency (Cronan et al 2001).

2-2 Origins of Performance Measurements

The idea of monitoring the performance of healthcare providers is not new. In the early 1900s, Dr. Codman launched the concept of performance measurement for healthcare and presented the idea in 1915 to the Boston Medical Society. He proposed a detailed system of records including post discharge follow-up and inter-hospital comparisons to assure quality of services and compare performance between physicians (Mallon WJ, 2000; 82: 1814). As expected his ideas were not accepted, and several years passed before healthcare institutions began measuring performance, quality, and productivity. On the logistics side another milestone is crucial. Modern logistics, operational concepts, and operations management (OM) as a system gained vast importance during World War II. This system was used by the American Armed Forces for the deployment of weapons, fuel allocation decisions, and planning of attack strategies and troop movements (Wagner H.1970). In the 1950s, industries observed that OM could be a substantial source of competitive advantage to provide better services. However, the healthcare sector did not see the need to improve its efficiency until the 1980s, when managed care competition and federal and local reimbursement reforms presented a serious financial challenge to medical institutions and service departments. In an economically challenging environment it becomes crucial to monitor performance so that healthcare centers can provide high-quality services while staying within operational boundaries. During the 1990s there was growing consensus about the need for radiology managers to investigate mechanisms for cost containment and

increase productivity, as qualitative measurement of healthcare delivery alone was not sufficient (Solomon A, Martino S. 1991).

Physicians and hospital administrators also agreed on monitoring healthcare quality and on the fact that this is impossible without the use of quality and operational indicators. Indicators create the basis for accountability, quality improvement, prioritization, and transparency in the healthcare system (Mainz J, Barteis PD. 2006), but even though most people are in favor of measurement, very few are comfortable being measured (Loeb, JM. 2004).

2-3 Definition of 'Key Performance Indicators - KPI'

A set of quantifiable measures that a company or industry uses to gauge or compare performance in terms of meeting their strategic and operational goals. KPIs vary between companies and industries, depending on their priorities or performance criteria. Also referred to as "key success indicators (KSI)". KPI's are an actionable scorecard that keeps your strategy on track. They enable you to manage, control and achieve desired business results.

2-4 The Balanced Scorecard (BSC) Approach in Imaging

A balanced score card (BSC) is more than a set of measures. It translates the strategy of the organization into objectives based on the Performance Indicators. The BSC attempts to develop a link between the organization's strategy, objectives, and measurements through consistency of the measurements and by adding a cause-effect relation between the variables (Peiró S. De la gestión de lo et al 2003).

Since strategy is an integral part of the BSC, it is key to review its definition. A strategy is an integrated set of actions consistent with the long term vision of an organization to deliver value to a chosen set of customers, with a cost structure that allows excellent returns (Estis AA - April 2002). With that concept in mind,

it becomes obvious that radiology departments require a strategy to increase returns and achieve organizational goals. To this end, it is best if hospital based radiology departments' work in close collaboration with the hospital administration in developing a common strategy and goals. An effective strategy for imaging encompasses technology, services, and management (World Health Organization (WHO).2007).

Imaging's strategy impacts many important aspects of hospital dynamics, such as service line development, physician recruitment, and overall revenue. Organizations must understand this impact and develop site-specific strategies to best meet their needs and potential. Providing imaging services involves much more than purchasing a scanner and plugging it in. Institutions that adopt a plug-it-in approach to imaging aren't successful and expose themselves to competition from other imaging providers. Senior leadership must define clear strategic goals that apply to the entire department. Knowing the goals enables managers to understand in what aspects of performance measurements must be centred. Operational decisions are then made in support of business strategies (Kaplan RS, Norton DP, et al 1996). Radiology administrators who are inexperienced in process management and redesign systems try to resolve their operational problems by ineffective strategies, such as identifying and cutting costs without deeply understanding the problems within the system, adding information systems and medical equipment to the existing ones, or imposing higher performance standards and holding employees responsible for meeting them (e.g., by tying bonuses to performance) without a system redesign. An effective approach would be to adopt the managerial skills of OM. OM is essential to bridge the gaps between traditional and modern radiology management. OM helps achieve goals by focusing on the analysis of processes, quality of standards and operational strategies to facilitate executive decision-making.

After studying and understanding the processes in a radiology department, a strategy is set. To have a strategy is the beginning. Developing a strategy that helps achieve the department's goals generates a need for tools to assess whether the strategy is effective or not. Hence, the establishment of a departmental BSC, as originally developed by Kaplan and Norton (Kaplan RS, Norton DP 1996). A BSC is composed of a balanced set of measures capturing the critical activities of the organization that are the drivers of future performance. "Balanced" refers to the inclusion of all-important aspects of the practice in the organization: financial, customer satisfaction, quality, productivity, employees' development, and organizational growth. These aspects have a tendency to overlap each other to generate a general view. Evaluation of individual aspects is avoided (Eddy DM. 1998). The BSC reflects the mission, vision, and strategic direction of an organization. This approach to encompass apparently conflicted areas was develop for use in different industries but a growing number of hospitals and health care organizations have begun to make the concept of their own (Behrens L, et al 2000). The idea is to approach development as a whole and avoid compartmentalized addressing of obstacle (Brinkmann A, et al 2003). BSC can be considered as a managerial tool that help the organization's leadership to define meaningful strategic objectives and measurable improvement and development (Zelman WN, et al 1999). It is vital to highlight the fact that a BSC should not be adapted from other organizations and should reflect special characteristics and needs. The BSC is constructed from a reduced number of specific and yet meaningful indicators[41.] The indicators included in the BSC are collectively referred to as "dashboard indicators (Zelman WN, et al 1999), a "dashboard" being the visual display of the MPI's included in the BSC. To develop a dashboard four (4) questions must be answered. What are the measures? What are the data sources? Does baseline data exist? And is there comparative data? (internally, externally, national) (Nelson E, et al 1998.) Thus, dashboard provides a comprehensive snapshot of all ongoing departmental

activities over time. The MPI's that constitute the dashboard should be easily accessible to everyone in a department. Management performance indicators (MPI) are objective tools that assess and evaluate key components of an organization, allowing setting goals at each level and tracking performance over time. MPI's are widely used in healthcare industry, even though there is no well established system, they are not unanimously accepted as tools, and they have traditionally been equated with financial measurement only. It has been suggested that in addition to financial outcomes, healthcare organizations should assess intangible assets that affect the bottom line such as clinical processes, staff skills and patient satisfaction (0liveira J.2003.). It is important to note that, to the extent of our knowledge, there is no published standard set of MPI's used by radiology departments across the UAE. One of the central issues in performance measurement remains the absence of agreement about what should be measured. MPI's are becoming an integral part of healthcare but further standardization of data collection is imperative". On one hand, too much information is costly to collect; on the other hand, too little information is useless. The challenge is to develop and implement indicators that uncover as much reality as possible.

The MPI's selected by the team should convert broad strategic goals into quantifiable metrics. A well-selected MPI's set has the following characteristics: it is accurate: it measures performance with precision; it is comprehensive: when compared with other indicators, it should give a clear picture of the key organizational processes; it is free from bias; information should be gathered impartially; it is quantifiable: it should be measurable to determine the extent to which desired outcomes are achieved; it is valid: it should measure what is relevant for achieving targets; and it is verifiable: the information collected should be such that it can be independently checked as correct by qualified individuals.

2-5 Previous study

Salazar et al. (1989), reviewed patients' complaints with reference to their case in radiology as well as to determine core areas for improvement. The researchers conducted a HIPAA-compliant study to examine all radiology-connected patient complaints acquired by institution's OPA (Office of Patient Advocacy) between April 1999 and December 2010 retrospectively. The journal used an internal review that classified the collected complaints into those that related to radiology staff members, medical complications, failure to offer patient-based care, and the ones which related to the quality in regards to radiologic benchmarks of professionalism, systems, and safety. The researchers calculated complaints per modality as a fraction of the number of radiologic assessment performed. The study results indicated that 153 radiology-connected complaints were reported. The greatest percentage (60.1% or 92 out of 153) illustrated a failure in practitioners to give patient-centered healthcare (Salazar et al. 514). The remaining complaints (26.2% or 40 out of 153) described physical discomfort (Lester 54). Complaints related to operational systems accounted for 68 of 153 (44.5%), 37 of 153 (24.2%) with safety, 26 of 153 (17%) with professionalism, and 22 of 153 (14.3%) with concerned staff members in a radiology department. The researchers concluded that the failure to give patient-centered care described the most common complaints. However, most of the complaints could also relate to systems issues. The recommendations proposed were improved in the areas of providers' interactions with the patients and delays.

Foos et al. (1989), conducted a reject analysis on digital radiography systems used throughout the medical imaging community. The analysis was conducted on 288000 CR (computed radiography) image records gathered from a UH (University Hospital) as well as a large CH (Community Hospital). All the records comprised images of information, for instance, view position and body

part, technologist identifier, and exposure level. Moreover, the records contained the information describing whether the image was rejected or not as well as the reason for the rejection. The research found out that across all departments, the rejection rate for UH was 4.4% and 4.9% for CH. Rejection rates were common in areas such as pelvis, in-department chest, spines, shoulder, hips, and facial or skull bones. These areas accounted for 8% of all rejected images for both institutions.

CHAPTER THREE

Materials and Methods

3-1Research setting

The Study was conducted in Al Raha hospital (UAE). It was elected to conduct this type of study because it has the most sophisticated radiology department and supports a comprehensive electronic hospital information system to manage patient files.

3-2 Participant recruitment

3-2-1 Study population

The study population consists of all patients send to medical imaging department for radiologic examination during duration of study from January to May of the year of 2015.

3-2-2 Sample size

The total number of images performed in medical imaging department was (22,420) images during duration of study.

3-2-3Data collection

Data were collected from electronic patient file of hospital information system (HIS) through data collection sheet.

3-3Data analysis

3-3-1 KPI01 Analysis

KPI01: Applied for the number of successful, quality images completed and the rates of compliance with institutional policies. Data were categorized

into accepted images and rejected ones (appendix-2).then statistical analysis applied to calculate number of images and percentage of each category.

3-3-2 KPI02 Analysis

KPI02: Applied for reporting time (routine), the period from the moment of patient entry into the imaging department until the completion of the report should not exceed twenty-four hours. Data were classified accordingly of compliance with institutional policies into two classes matching and not matching (appendix- 3), then statistical analysis applied to calculate number of images and percentage of each category.

3-3-3 KPI03 Analysis

KPI03: Applied for the emergency room CT round time, the period from the moment of patient entry into the imaging department until the completion of the report should not exceed sixty minutes. Data were collected and calcified accordingly then statistical analysis applied to calculate number of and percentage of each category (appendix-4).

3-3-4 KPI04 Analysis

KPI04: Applied for Patient satisfaction with the safety and quality of care, it is not practical to ask every single patient how he or she feels about the safety and quality of care. Instead, we query a relatively small number of patients (20%) = (4,484) patients (appendix-5). The mathematical procedures convert information about the sample into intelligent guesses about all patients during that month.

3-3-5 PI Analysis

PI: applied for net performance, a relative value has been given to every KPI then a mathematical process was applied to get the net performance. Performance = ∑KPIs x RV.

Performance = (KPI01%)x35+(KPI02%)x30+(KPI03%)x20+(KPI04%)x15.

CHPTER FOUR

Results

4-1 KPIs

4-1-1 Rejected image rate (kpi01)

Complete and exact advanced radiography QA obliges that a component be set up to constrain technologists to enter reject information data into a database, for example, the catch gadget programming ought to oblige that this information be entered for each rejected image before another image can be examined. The reject information has to incorporate the purpose behind dismissal, technologist ID, tolerant ID, and gear and introduction related data (Foosbet al., 91). In addition, the product and equipment framework should be set up with the goal that all image records, including both acknowledged and rejected records, are halfway open and properly sorted out. Computerized dashboards that midway gather and accumulate image insights are presently accessible to perform this capacity. In any case, systems to empower a QA technologist or restorative physicist to outwardly review rejected images should likewise be given.

Institutionalized phrasing and definitions for QA insufficiencies should be set up, alongside the related preparing, to take out the wrong naming of rejected images. Conventions must be built up that oblige the remark fields to be finished at whatever point there is a nonspecific purpose behind dismissal. Unless the image is labeled as a reject, frameworks by and large don't give an approach to keep a QC image from being conveyed to the PACS (Foosbet al. 91). Hence, conventions should be actualized whereby images that are rejected due to preventive support or QC-related reasons are appropriately marked so they are effectively recognized from patient-related rejected images. One

approach to guarantee that this happens is to oblige that for each rejected image, the technologist determine the exam sort and explanation behind dismissal, i.e., disposing of the idea of a default exam sort (Foosbet al. 91). This ought to diminish the quantity of deleted plate images that are mislabeled. Receiving institutionalized wording and holding fast to best-rehearse conventions will permit locales to all the more completely comprehend their QA execution and drive them to more engaged preparing projects.

Better QC strategies might fundamentally advantage versatile midsection x-beam image quality, including having the ability to show advanced radiography images at the purpose of catch. Versatile CR and DR frameworks now give this capacity.

To condense, there is a chance to enhance the culmination and precision of reject investigation for advanced radiography frameworks through the institutionalization of information passage conventions and enhanced reporting and examination techniques. Exact reject examination gives the premise from which to create focused on preparing projects and serves to moderate the biggest wellspring of patient rehash exposures.

Table 4.1: characteristics of kpi01 Analysis of rejected image rate using the Clinical KPI01 template

	Element	**Description**
1	KPI title	Rejected image rate.
2	KPI description	The metrics involved in this KPI include: • The number of new successful, quality images completed and the rates of compliance with institutional policies.
3	KPI target	2015: ≥ 95%
4	KPI calculation	(Numerator/Denominator)*100 Numerator; determined by the number of approved number of images. Denominator; the total number performed images.
5	Data source (s)	• Systems for facility reporting • Systems for administrative reporting • Surveillance system
6	Data collection	Data was collected on a daily basis
7	KPI monitoring	The KPI is observed on a monthly basis.
8	KPI reporting frequency	The reporting frequency will be conducted on a quarterly basis.
9	Relative value	35
10	Code	Kpi01

Table 4.2: kpi01 result (actual) shows the actual result of kpi01 for five months (Jan – May /2015) as well as the average and target goal.

Code	Clinical Indicators	Jan-15	Feb-15	Mar-15	Apr-15	May-15	Average	Target Goal
kpi01	Reject Images Analysis	95.21%	95.33%	95.36%	95.42%	95.54%	95.37%	≥ 95 %

Table 4.3: kpi01 result (relative value) shows the relative value result (x35) of kpi01 for five months (Jan – May /2015) as well as the average and target goal.

Code	Clinical Indicators	Relative value	Jan-15	Feb-15	Mar-15	Apr-15	May-15	Average	Target Goal
kpi01	Reject Images Analysis	35%	33.32%	33.37%	33.38%	33.40%	33.44%	33.38%	≥ 33.25 %

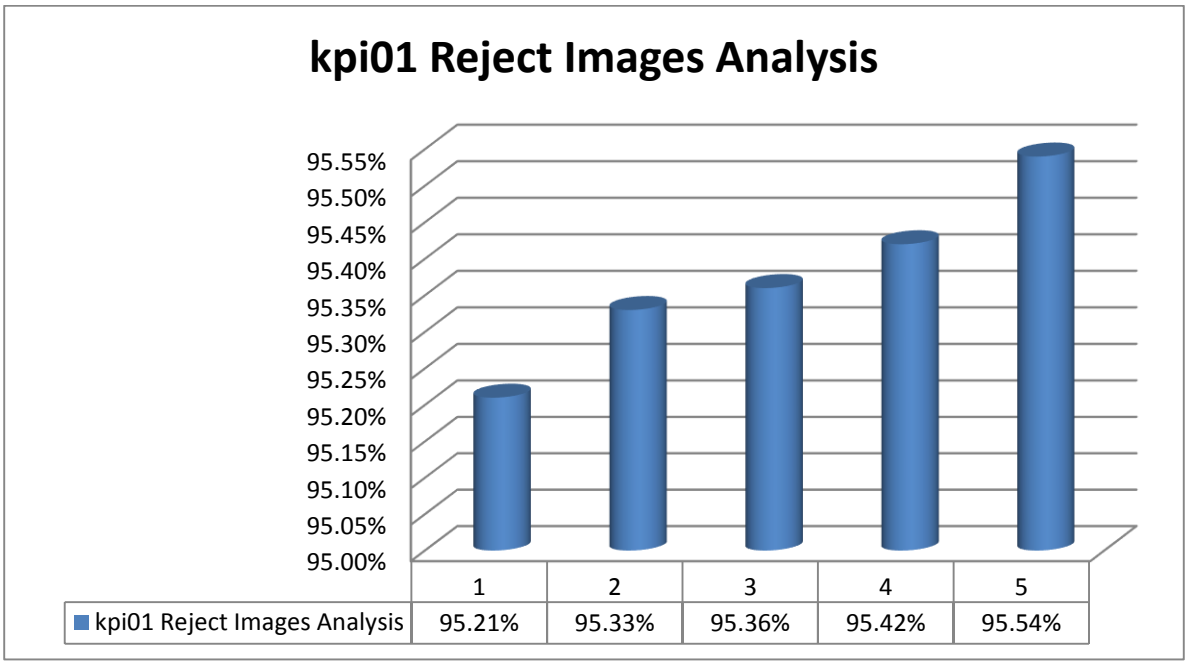

Figure 4.1: kpi01 result (actual): shows the actual result of kpi01 for five months (Jan – May /2015).

4-1-2 Reporting time (routine) (kpi02)

In a large patient percentage, image comprises of a pivotal duty in both treatment and diagnosis. Core to this is the timely reporting or communication of the identified radiology findings that are vital or life-threatening, unexpected, or urgent (that is, need action within a time span of 24 hours). A significant quantity of adverse events is directly connected to failure to act on the radiological imaging documentation or reports by the referring clinicians.

In the current days, there are no approved national reference standards in place to examine the required turnaround times. NHS Foundation Trust (6) states that an ongoing domestic reporting audit consistently demonstrates that 90% reporting of all evaluations take place within 5 working days. However, this report strives to report the GP, ED and in-patient department evaluations on the same day. Pressing results are reported within 3 hours, the time frame relying on the characteristic of the imaging results. Notably, the turnaround times of reports may vary depending on the level of staffing within the specific department. Precedence is offered in-patient, precedent requests as well as the

Table 4.4: characteristics of kpi02 - Analysis of reporting time (routine) using the Clinical KPI02 template

	Element	**Description**
1	KPI title	Reporting time (the period should not exceed 24 hours from the patient's arrival time to the report).
2	KPI target	2015: 95%
3	KPI calculation	(Numerator/Denominator)*100 Numerator: determined by the number of short, successful turnaround time within the provided 24 hour Denominator: the approximated total number of reported patients receiving radiology services.
4	Data source (s)	• Systems for facility reporting • Systems for administrative reporting • Surveillance system
5	Data collection	Data was collected on a daily basis.
6	KPI monitoring	The KPI is observed on a monthly basis.
7	KPI reporting frequency	The reporting frequency will be conducted on a quarterly basis.
8	Limitations	The performance indicator determines the number of successful, short turnaround time and not the negative effects they cause to the quality of the screening process.
9	Relative value	30
10	Code	Kpi02

Table 4.5: kpi02 result (actual): shows the actual result of kpi02 for five months (Jan – May /2015) as well as the average and target goal.

Code	Clinical Indicators	Jan-15	Feb-15	Mar-15	Apr-15	May-15	Average	Target Goal
kpi02	Reporting Time (routine) within 24hrs.	99.50%	99.54%	99.52%	99.57%	99.61%	99.55%	≥ 95 %

Table 4.6: kpi02 result (relative value): shows the relative value result (x30) of kpi02 for five months (Jan – May /2015) as well as the average and target goal.

Code	Clinical Indicators	Relative value	Jan-15	Feb-15	Mar-15	Apr-15	May-15	Average	Target Goal
kpi02	Reporting Time (routine) within 24hrs.	30%	29.85%	29.86%	29.86%	29.87%	29.88%	29.86%	≥ 28.50

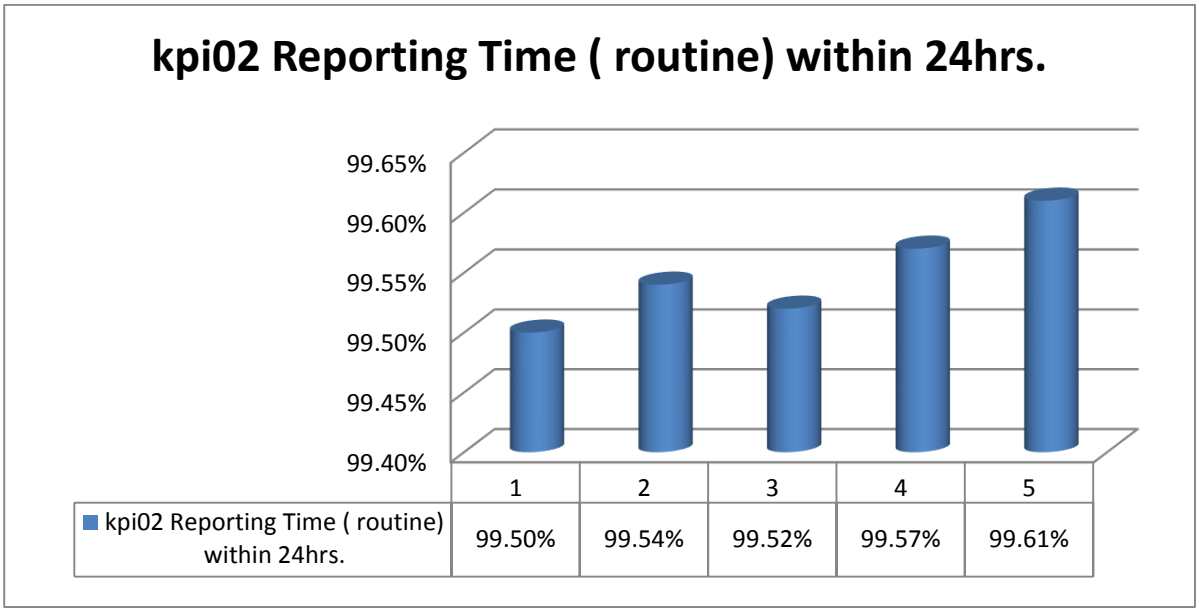

Figure 4.2: kpi02 result (actual): shows the actual result of kpi02 for five months (Jan – May /2015).

4-1-3 Emergency room CT reporting time (kpi03)

Response-time (round time) indicators are adopted in several countries as a way of measuring the quality of services offered by care providers in pre-hospital emergency (Wankhade 390). Such KPIs give a valuable worthwhile source of information when applied in conjunction with clinical indicators focusing on patient outcomes.

The indictor types for emergency room CT round time that will be used to access the performance of the radiology department is structured as follows.

- Input; refers to the number of radiology centers with an emergency room CT.
- Output; the percentage (%) of radiology emergency department visits emerging in radiology center admission.
- Outcome; success rate among patients entering via the emergency CT room department.
- Efficiency; the percentage (%) of visits to the emergency CT room with patient seen in ≤ 60 minutes.

Table 4.7: characteristics of kpi03: Analysis of the KPI using Clinical KPI03 Template

	Element	**Description**
1	KPI title	Patient requiring acute care (patients with traumas) who received emergency room CT services.
2	KPI description	The percentage of the population estimate of patients requiring the services of emergency room CT with advanced traumas.
3	KPI target	2015: 63%
4	KPI calculation	(Numerator/Denominator)*100 Numerator; refers to the number of patients with advanced traumas who received the most effective radiology services. Denominator; refers to the total number of reported patients with traumas.
5	Data source (s)	• Systems for facility reporting • Systems for administrative reporting • Surveillance system
6	Data collection	Data was collected on a daily basis.
7	KPI monitoring	The KPI is observed on a monthly basis.
8	KPI reporting frequency	The reporting frequency will be conducted on a quarterly basis.
9	Limitations	The indicator determines emergency room CT round time used in diagnosis process and not the successful numbers of services offered.
10	Relative value	25.
11	Code	Kpi03

Table 4.8: kpi03 result (actual): shows the actual result of kpi03 for five months (Jan – May /2015) as well as the average and target goal

Code	Clinical Indicators	Jan-15	Feb-15	Mar-15	Apr-15	May-15	Average	Target Goal
kpi03	ER CT Reporting Time within 60 Min	83.23%	83.51%	86.17%	86.21%	86.70%	85.16%	≥ 85 %

Table 4.9: kpi03 result (relative value): shows the relative value result(x20) of kpi03 for five months (Jan – May /2015) as well as the average and target goal.

Code	Clinical Indicators	Relative value	Jan-15	Feb-15	Mar-15	Apr-15	May-15	Average	Target Goal
kpi03	ER CT Reporting Time within 60 Min	20%	16.65%	16.70%	17.23%	17.24%	17.34%	17.03%	≥ 19.00

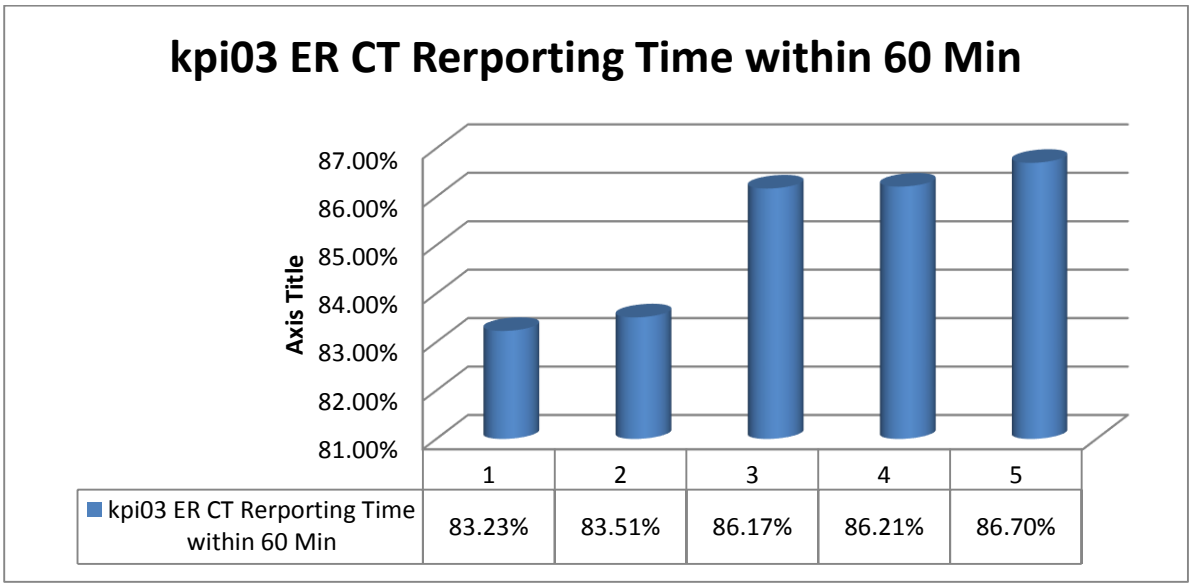

Figure 4.3: kpi03 result (actual): shows the actual result of kpi03 for five months (Jan – May /2015).

4-1-4 Patient satisfaction (kpi04)

In the recent years, the issue of patient satisfaction in provision of healthcare has undergone criticism as well as poor client satisfaction in other industrial sectors. Often, the financial concerns that exist are applied as an excuse for the rampant and poor patient satisfaction. Such an excuse cannot justify the rude treatment of a patient or the disrespect the providers accord them in the care provision process. Patients are the quintessence of why radiologists exist. Their increasing analysis, over the healthcare they receive as well as the services radiologists provide will significantly affect the future of care in the U.A.E. Therefore, healthcare providers need to focus on respect for patients and teamwork as well as co-workers as the basis for enhancing patient satisfaction. In this regard, the table below provides a framework of using KPIs in radiology department to improve the quality of care given to patients in the bid to increase reports of patient satisfaction.

Table 4.10: characteristics of kpi04 - Analysis patient satisfaction using the Clinical KPI04 template

	Element	**Description**
1	KPI title	Patient satisfaction.
2	KPI description	Patient satisfaction with the safety and quality of care.
3	KPI target	2015: 66%
4	KPI calculation	(Numerator/Denominator)*100 Numerator: determined by the number of satisfied number of patients. Denominator: the approximated total number of patients who received radiology services.
5	Data source (s)	• Systems for facility reporting • Systems for administrative reporting
6	Data collection	Data was collected on a daily basis
7	KPI monitoring	The KPI is observed on a monthly basis.
8	KPI reporting frequency	The reporting frequency will be conducted on a quarterly basis.
9	Limitations	The performance indicator determines the number of satisfied patients, but fails to provide a detailed understanding of the cost factors used to receive the required quality care..
10	Additional Information	Techniques of measurement include: For the identified numerator, national program records amassed from the monitoring tools of the program such as summary reporting forums and patient registers.
11	Relative value	15
12	Code	Kpi04

Table 4.11: kpi04 result (actual): shows the actual result of kpi04 for five months (Jan – May /2015) as well as the average and target goal.

Code	Clinical Indicators	Jan-15	Feb-15	Mar-15	Apr-15	May-15	Average	Target Goal
kpi04	Patient Satisfaction	77.10%	77.13%	77.17%	77.19%	77.20%	77.16%	≥ 80 %

Table 4.12: kpi04 result (relative value): shows the relative value result (x15) of kpi03 for five months (Jan – May /2015) as well as the average and target goal.

Code	Clinical Indicators	Relative value	Jan-15	Feb-15	Mar-15	Apr-15	May-15	Average	Target Goal
kpi04	Patient Satisfaction	15%	11.57%	11.57%	11.58%	11.58%	11.58%	11.57%	≥ 14.25

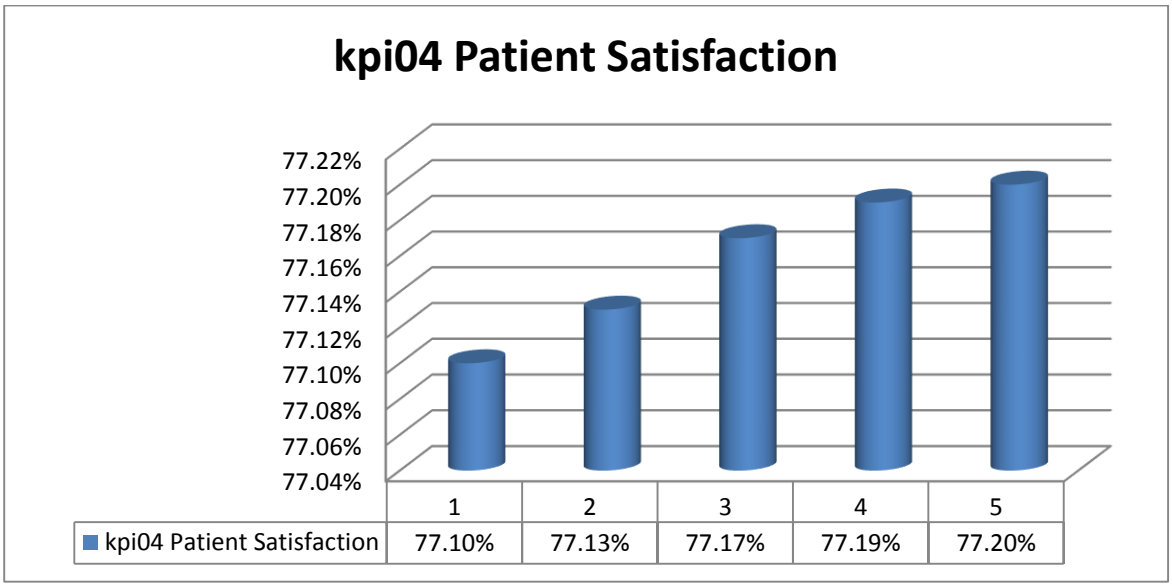

Figure 4.4: kpi04 result (actual): shows the actual result of kpi04 for five months (Jan – May /2015).

4-2 PI - Final report (performance)

Clinical Indicators Analysis Report - Jan-May / 2015

Table 4.13: kpis result (actual): shows the results of all kpis for five months (Jan – May /2015) as well as the averages and target goals.

Code	Clinical Indicators	Jan-15	Feb-15	Mar-15	Apr-15	May-15	Average	Target Goal
kpi01	Reject Images Analysis	95.21%	95.33%	95.36%	95.42%	95.54%	95.37%	≥ 95 %
kpi02	Reporting Time (routine) within 24hrs.	99.50%	99.54%	99.52%	99.57%	99.61%	99.55%	≥ 95 %
kpi03	ER CT Reporting Time within 60 Min	83.23%	83.51%	86.17%	86.21%	86.70%	85.16%	≥ 85 %
kpi04	Patient Satisfaction	77.10%	77.13%	77.17%	77.19%	77.20%	77.16%	≥ 80 %

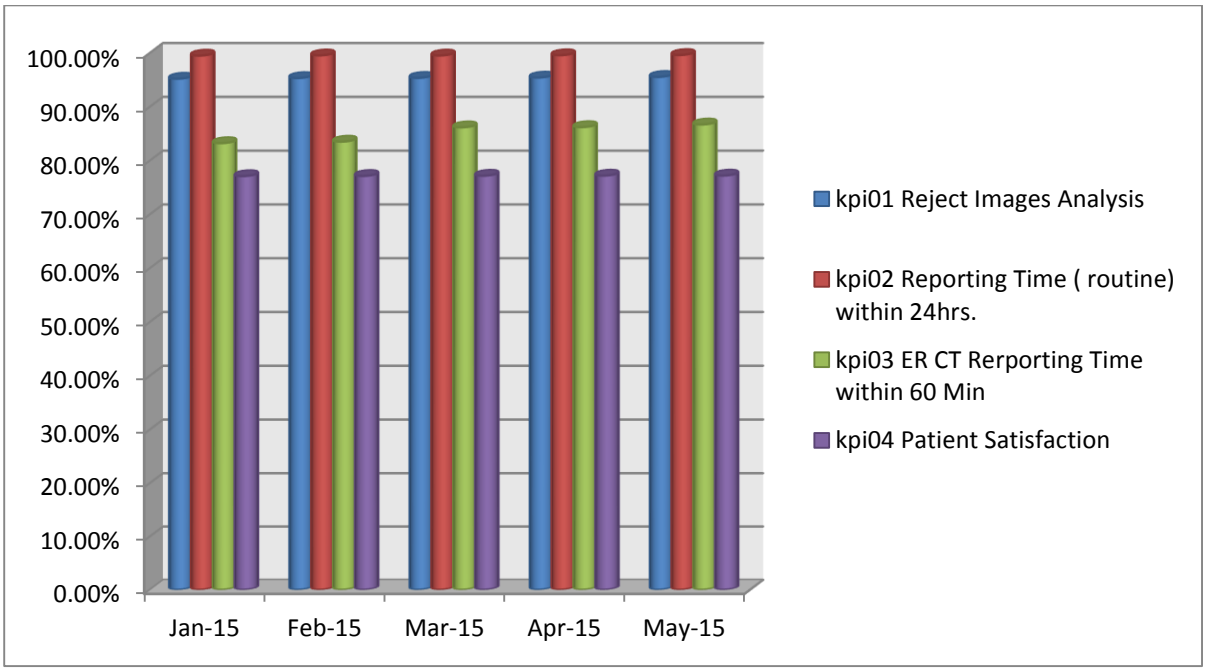

Figure 4.5: kpis result (actual): shows the actual result of all kpis for five months (Jan – May /2015).

Table 4.14: kpis result (relative value) and PI result (actual): shows the relative value results of all kpis for five months (Jan – May /2015) as well as the averages and target goals.

Code	Clinical Indicators	Relative value	Jan-15	Feb-15	Mar-15	Apr-15	May-15	Average	Target Goal
kpi01	Reject Images Analysis	35%	33.32%	33.37%	33.38%	33.40%	33.44%	33.38%	≥ 33.25 %
kpi02	Reporting Time (routine) within 24hrs.	30%	29.85%	29.86%	29.86%	29.87%	29.88%	29.86%	≥ 28.50
kpi03	ER CT Reporting Time within 60 Min	20%	16.65%	16.70%	17.23%	17.24%	17.34%	17.03%	≥ 19.00
kpi04	Patient Satisfaction	15%	11.57%	11.57%	11.58%	11.58%	11.58%	11.57%	≥ 14.25
PI	Total performance indicator	100%	91.38%	91.50%	92.04%	92.09%	92.24%	91.85%	≥ 95.00

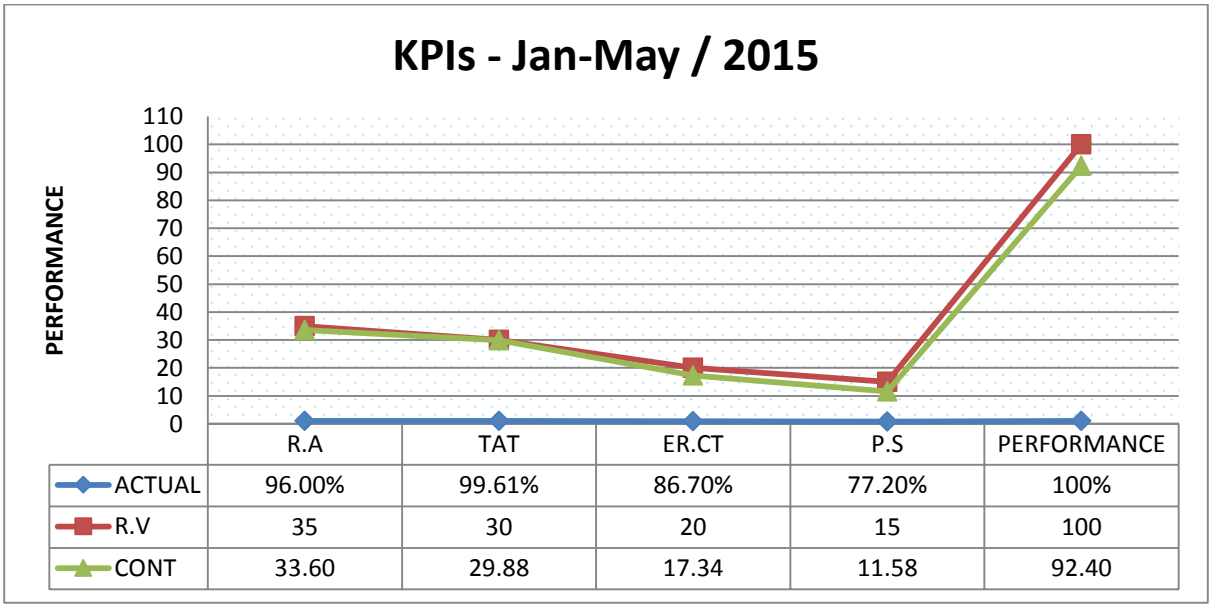

Figure 4.6: kpis result (relative value) and PI result (actual): shows the relative value result of all kpis and the net performance indicator pi (for five months (Jan – May /2015).

CHAPTER FIVE

Discussions, Conclusions, and Recommendations for Further Research

5-1 Discussion

Information has a pivotal duty in promoting improvements in the quality and safety of patient care. Measurement of performance promotes accountability to the stakeholders including the Government, clinicians, service users, and the public by enhancing informed decision-making and reliable, safe and high quality care through communicating, analyzing, and monitoring the magnitude to which healthcare organizations attain their key objectives. Accurate measurement of performance is grounded on the information that is comparable, good quality, and shared within the health sector.

KPIs are fundamental to the process of performance measurement since they help to measure and identify levels of performance in the services appropriately (Abujudeh et al., 577). The NSSBH (National Standards for Safer Better Health) acknowledges the use of KPIs as part of the process of systematically monitoring, evaluating, and continuously improving the quality of care. In their accord, key performance indicators are not in the position to improve quality. However, they effectively act as alerts to recognize good quality, offer comparability between and within similar services. The services should entail areas where there are improved opportunities as well as where a more exhaustive investigation of principles is warranted. The fundamental objective of KPIs is to add the stipulation of a high quality, effective, and safe service that satisfies the needs of service consumers.

Because of their usefulness, MPI's have increased in importance around the world (e.g., summit in París, Danish National Indicator Project,

National Service Frameworks in the UK) (Johnston R. 1999) Especially in the United States, with the tremendous amount of money spent in healthcare

and today's competitive environment, it is of paramount importance to use MPI's. To manage a radiology department without measuring performance would be "flying blind" for the managerial team, and that in todays economical environment is unthinkable. MPI's in radiology departments are nothing if not essential.

Given present conditions radiologists are more involved in economic, financial and managerial aspects of their practice than a decade ago; This trend is most likely to continue making this subject one that deserves special attention and needs to be taught to current and future healthcare leaders, including radiologists, hospital administrators, radiology and hospital managers, and those under training to fill these positions.

There are several advantages of employing performance indicators in radiology. MPI's can increase revenue and operational margins for departments; they help to identify and correct poor work processes and Identify the activities that decrease quality of services provided and negatively affect customers' satisfaction". These advantages and several others explain why about 95% of the radiology departments in the US measure their performance. Despite the extensive use of indicators, there is no agreement in the appropriate set of indicators that should be used by radiology departments.

The lack of standardized set of MPI's In the US, which includes not only the indicators needed but the amount, frequency, and rules for measuring, suggest the need for creating a standard system. Such a system should include not only productivity indicators but also financial, quality, and customer satisfaction ones.

Productivity Indicators are the most widely used and most commonly include: examination volume, examination volume per modality and professional. The problem with these measures is that they are not comprehensive of a radiologist's clinical productivity and fail to include activities such as continuing medical education, research, administrative and

teaching duties. Although these activities are not measurable in terms of clinical productivity, they are an important part of radiologist's workload and thus need to be incorporated into the evaluation of his/her performance.

5-2 Conclusion

Healthcare providers around the world are faced with the notion of limited resources, forcing them to look for better ways to utilize their assets. In years to come, it will be essential for the healthcare sector to use resources as efficiently as possible; making it crucial to implement managerial tools to improve overall performance.

Given the extraordinary importance that imaging has gained; radiology is becoming a fundamental piece in the overall performance of healthcare organizations. The success of radiology departments will depend on the implementation of managerial tools proven to be effective.

However, all approaches appear to demonstrate an essential gap in regards to patient satisfaction, turnaround time, CT emergency room round trip time, and rejected image rate. Concentrating on the particular instance of symptomatic imaging administrations in radiology focus setups fundamentally affect on aggregate production time, creating a lessening of facility limit.

5-3 Recommendations

In order to improve performance in radiology department the study strongly recommends to:

1- Technologists and Radiology department administrators have to control their imaging performance.

2- Senior leadership must define clear strategic goals that apply to the entire department.

3- The radiology divisions must recognize their own KPIs and initiate their estimation now as opposed to waiting for outside factors with limited knowledge about radiology to make these determinations.

4- Radiology educational institutions must play active role in determining the policy frameworks and strategies for radiology departments, as well as including concepts of performance measurement in the curriculum of these institutions.

5- Performance indicators for each radiology department defined according to the facilities available and in accordance with the goals, objectives and visions of its own.

6- The publication of information and research in new approaches to management in radiology should become a healthcare priority.

7- Further study needs to focus on integrating this new type of approach, which possibly can be refined for improved performance.